MASTERY ASSESSMENTS
(Criterion Referenced Tests)

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For

MATHEMATICS UNITS
Class XI

Under

Individually Guided System of Instruction
(IGSI)

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PREFACE

Several objective-based learning strategies developed in the last two decades have basically changed the meaning of measurement in education and put new requirements on the construction, scoring, and analysis of educational tests. Educational measurements satisfying these demands are called criterion-referenced, while measurements utilising the normal curve are termed as norm-referenced.

One such objective based learning system is called the Individually Guided System of Instruction (IGSI). A detailed description of this system is available under separate cover. Briefly, in the IGSI, the entire course is divided into a sequence of small learning units. The learning objectives of each unit are clearly defined and kept fixed during the course. The student is allowed to go to the next unit only after having demonstrated mastery of the preceding one. The mastery assessment is used to separate students who have reached a pre-determined level of mastery from those who have not reached this mastery level. For students who have not reached mastery level, the response to the assessment along with oral questions is used for diagnosis and consequently for prescription of corrective learning materials or remedial instruction. The mastery assessments are constructed to measure performance vis-a-vis objectives stated in the unit. They indicate student's performance on each objective. If a student has not reached mastery level vis-a-vis a certain objective, the assessment can be used to indicate which part of the unit he has to cover again. A student may use more than one try to master a unit. This requires preparation of more than one mastery assessments of equal difficulty on the same objectives.

The mastery assessments described above could be classified under the head criterion referenced measurements where criteria are the objectives of each unit. These measurements are used for instructional purposes. In particular, they are not used for grading students (summative evaluation). For that purpose a separate test is administered at the end of the course, covering the content of all units. The traditional testing procedure may, however, be better suited for differentiating between subjects and mostly serve as an instrument for selection. In mastery assessment, however, there is no differentiation in level since the learning objectives and the mastery level are kept fixed and equal for all students.

This booklet is a compilation of mastery assessments we have prepared for IGSI programme in class XI Mathematics course of the Central Board of Secondary Education. The entire course is split into 21 units. These units are available under a separate cover. For each unit five mastery assessments have been included.

I am grateful to Dr. R.P. Gupta, Reader in Mathematics for working as co-investigator in this project and giving expert advise in mathematics. My thanks are also due to Dr. K.J. George, Senior Project Fellow, for assistance in preparing this material and implementing IGSI in mathematics.

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REPORT ON THE PROJECT TITLED [illegible] INDIVIDUALISED [illegible] SYSTEM OF INSTRUCTION IN CLASS-XI MATHS COURSE

The system was tried out in one mathematics section of Class XI of the Central School, Gole Market, New Delhi, during the entire academic year 1982-83. There were two equivalent Sections – A and B in the PCM group. Section A was taught through the traditional system, while Section B through the IGSI. The entire mathematics course for class XI of the CBSE was divided into 22 small units. The average time for completing each unit was one-and-a-half week. To start with, skeleton study guides were prepared, keeping in view the textual material in mathematics prepared by the NCERT for Class XI. For each unit, a study guide was provided which contained the following:(copy enclosed)

1. Introduction

2. Objectives

3. Suggested procedure

4. Additional notes

5. Self-assessment

The students took the help of this study guide in order to attain the stated objectives. Whenever the students had any question on the material, they would come to the class to seek the help of the tutor on an individual basis. When they felt that they were ready to demonstrate their mastery of the material in the unit, the tutor would administer a test which he would mark immediately in the presence of the students. If the students were unable to demonstrate their mastery, they would re-study the material until they could pass a similar test on the same unit. There was no penalty for repeating a unit test.

Role of the Teacher: The teacher of the IGSI section had a different role than the teacher of the traditional section. The following responsibilities were assigned to the teacher of the IGSI group:

1. To maintain the progress report of each individual

2. To re-check the mastery test already checked by the tutor

3. To maintain discipline in the classroom

4. To explain mathematical concepts to the students when the tutor failed to explain

5. To formulate and announce the grading policy in the class

Tutors: The tutors were drawn from mathematics sections of Class XII. The timetable was so adjusted that whenever Section B of Class XI had mathematic period, Class XII (mathematics) had either SUPW, Library, or free period. There were a total of nine periods for Class XI. Two period blocks were provided.

Additional Funds: Practically no additional funds were needed by the school. However, some funds for developing and printing/cyclostyling the appropriate material were needed.

Classroom : No special classroom was required for the experimental group. The same ordinary classroom with sufficient chairs and tables was used.

Time : No extra time was allowed for this group. The time allowed was the same as that for the traditional group.

Mastery Test: A set of five assessments was prepared on each unit. These were kept in the custody of the teacher. Any of the five assessments could be drawn at random and given to the students who wanted to take them. (copy enclosed)

Results

At the end of the session, a common examination designed by the CBSE was given to both the sections A and B. The two sections were made equivalent before starting the experiment. It is observed that :

1. There are more students getting high marks in the IGSI group.

2. The IGSI has benefitted the low-achievers also.

3. The IGSI has also resulted in significantly better achievement of the gifted students.

The average marks of the students in section A were 43 and of those in section B were 53. This shows an increase of 10 per cent marks which could be attributed to the I.S.I.

The general reaction of the students to the IGSI was also favourable. Although the students spent more time in mastering the material, they enjoyed the sense of better comprehension of the material. In general, their attitude towards mathematics seemed to have improved.

Conclusion

In general, the IGSI seems to have worked better than the traditional system of instruction. For developing countries like India, having large population, the IGSI seems to have greater prospects. It uses human beings to help other human beings to achieve the same level of mastery thereby democratising education. This system of instruction encourages more personal interactions between students and tutor, students and the teacher, students and the peer, etc. It is hoped that such interactions would help in bringing about social change in our society. In a rural-based country like India, a central agency could prepare the necessary materials and supply to all parts of the country. With minor modifications, suiting local conditions the IGSI may be tried for mass education at the senior secondary school level. It may also be tried out in colleges and universities.

TITLES OF IGSI UNITS

Unit-1	:	Number Systems I
Unit-2	:	Number Systems II
Unit-3	:	Complex Numbers
Unit-4	:	Quadratic Equations
Unit-5	:	Quadratic Inequations
Unit-6	:	Principle of Mathematical Induction
Unit-7	:	Permutations
Unit-8	:	Combinations
Unit-9	:	Binomial Theorem
Unit-10	:	Functions
Unit-11	:	Trigonometry I
Unit-12	:	Trigonometry II
Unit-13	:	Co-ordinate Geometry I
Unit-14	:	Coordinate Geometry II
Unit-15	:	Vectors
Unit-16	:	Determinants
Unit-17	:	Sequences and Series I
Unit-18	:	Sequences and Series II
Unit-19	:	Calculus I
Unit-20	:	Calculus II
Unit-21	:	Calculus III

UNIT - I

ASSESSMENT - 1

1. State Peano's Axioms.
2. Does commutative property hold for the operation of subtraction for the system of rational number ? Explain and illustrate with an example.
3. State Trichotomy law.
4. If $p < q$ be two integers and $r > o$ be any integer then is it true that $pr < qr$: If not true why.
5. Find three rational numbers between $\frac{2}{3}$ and $\frac{5}{4}$
6. Express the following rational numbers as terminating or non terminating decimals.

$$\frac{12}{5}, \quad \frac{13}{15}, \quad \frac{17}{3}$$

7. Find the rational number equivalent to $2.2\overline{3085}$.

UNIT - 1

ASSESSMENT - II

1. State Peano's Axioms
2. Does the commutative property hold for the operation of division in the system of rational numbers? Explain and illustrate with a numerical example.
3. Prove that the system of rational numbers is closed with respect to the operation of division. Are there any exceptions?
4. Find three rational numbers between $-\frac{1}{2}$ and $\frac{1}{2}$
5. If $a > b$ are two rational numbers show that $a > \frac{a+b}{2} > b$
6. Express the following rational numbers as terminating or non terminating decimals.

   $$\frac{65}{21}, \quad -\frac{9}{5}, \quad -\frac{17}{13}, \quad -\frac{21}{8}$$

7. Find the rational number equivalent to $3.\overline{428571}$

UNIT - 1

ASSESSMENT - III

1. Define 'greater than' and 'less than' order relation.
2. Find the smallest positive integer x for which
$-\frac{8}{15} > \frac{17}{x}$
3. Arrange the following rational numbers in a chain of inequalities.

$$\frac{-19}{60}, \frac{90}{31}, 0, \frac{9}{2}, \frac{-7}{19}, 3$$

4. If a < b be two rational numbers and c < o be any other rational number, then prove that ac > bc.
5. Find two rational numbers between $\frac{2}{3}$ and $\frac{3}{2}$
6. Find the rational number equal to $0.\overline{003}$.

UNIT - 1

ASSESSMENT - IV

1. State Peano's Axioms.
2. Does associative property holds for the operation division in the set of rational number ? Explain.
3. Express the following rational numbers as terminating or non terminating recurring decimals.

$$\frac{12}{7}, \frac{5}{7}, \frac{9}{5}, \frac{32}{21}$$

4. Find the rational number equal to 0.231111.....
5. Given two rational numbers $a = 0.\overline{63}$ and $b = 0.\overline{64}$ find a rational number x such that $a < x < b$
6. Determine the order relation between $\frac{a}{7}$ and $\frac{x}{5}$ if $a < x$.
7. Find the largest positive integer x for which $\frac{15}{23} < \frac{29}{x}$

UNIT - 2

ASSESSMENT - I

1. If a, b, c are real numbers and if $a < b$ and $c > 0$, then show that $ac < bc$.

2. Approximate $\sqrt{7}$ up to three decimal places.

3. Represent $(\sqrt{3} - \sqrt{2})$ on the number line.

4. Prove that $(\sqrt{5} - 3)$ is an irrational number.

5. Write two irrational numbers between $2\sqrt{3}$ and $3\sqrt{2}$.

6. Is 139 a prime number ?

7. Is 2. 3080038000838000008888............... an irrational number ? If so why ?

8. Define $/ x /$ and show that $/ x / - / y / \geq / x - y /$

9. Find the values of x such that $/ 1 - x / < 6$.

UNIT - 2

ASSESSMENT - II

1. Prove that $\log_{10}(2)$ is an irrational number.

2. Prove that $(\sqrt{2} + 1)$ is an irrational number.

3. Represent $2\sqrt{5}$ on the number line.

4. Is $(3 + \sqrt{7})(4 - \sqrt{13})(3 - \sqrt{7})(1 + \sqrt{3})$ irrational ?

5. Represent $\sqrt{5}$ by decimals (upto 3 decimal places).

6. Is 5. 0362100438000438 ....irrational ?

7. Write three irrational numbers between 2 and 3.

8. Show that for real numbers x and y

$$\big|\, |x| - |y| \,\big| \leq |x + y|$$

9. Find the values of the real number x such that

$$|3x - 2| < 7$$

UNIT - 2

ASSESSMENT - III

1. Prove that $(\sqrt{6} - 3)$ is an irrational number.

2. If a and b are rational numbers and if $\sqrt{ab}$ is irrational then prove that $(\sqrt{a} + \sqrt{b})$ is irrational.

3. Show that $\sqrt{a}$ is irrational when a is a positive irrational number.

4. Write two irrational numbers between 1/[illegible] and $\frac{1}{2}$

5. Is 730219 8395 a prime number ?

6. Is $\sqrt{55125}$ a rational number ?

7. Determine a and b such that $a < \sqrt{3} < b$ and $(b - a) = 0.01$.

8. Prove that $\frac{1}{2}\left(|x + y| - |x - y| \right) = y$

9. Define $|x|$ and show that $\big| |x| - |y| \big| \leq |x - y|$

UNIT - 2

ASSESSMENT - IV.

1. Show that $\log_{10}\left(\frac{3}{2}\right)$ is an irrational number.

2. If $a \neq 0$ is a rational number and $x \neq 0$ is an irrational number show that $a + x$, $a - x$, ax, $\frac{a}{x}$, $\frac{x}{a}$ are all irrationals.

3. Represent $2\sqrt{3}$ and $-2\sqrt{3}$ on the number line.

4. Represent $(\sqrt{3} - \sqrt{2})$ on the number line.

5. Is 92134201251 a prime number ?

6. Represent $\sqrt{8}$ approximately by decimals. Do the calculations up to three decimal places.

7. Write two irrational numbers between - 3 and 3.

8. Determine a and b such that $a < \sqrt{2} < b$ and $b-a=0.01$

9. Show that $\left| |x| \quad |y| \right| \leq |x + y|$.

UNIT - 2

ASSESSMENT - V

1. Prove that $(2 - \sqrt{5})$ is an irrational number.
2. Is $\left(\sqrt{5} + \frac{1}{\sqrt{5}}\right)^2$ irrational?
3. Represent $2\sqrt{3}$ on the number line.
4. Find two irrational numbers between $\sqrt{\frac{2}{3}}$ and $\sqrt{\frac{3}{2}}$.
5. Find the values of x such that $|2\sqrt{2} - x| \leq \sqrt{2}$
6. Determine a and b such that $a < \sqrt{3} < b$ and $b - a < 0.02$.
7. If p^2 is an integer multiple of 5 show that p is an integer multiple of 5.
8. Is 596512882691 a prime number ?
9. Is $\sqrt{133}$ a rational number ?

UNIT - 3

ASSESSMENT - 1

1. Find the square roots of the following real numbers

   (i) $-\frac{225}{7}$ (ii) $-\frac{180}{125}$ (iii) -144

2. Find the values of x and y if

   (i) $(3y+2)+i(6-4x)=0$

   (ii) $2x+ix-3y-iy=6-i9$

   (iii) $(4-5y)+i(3-2x)=0$

3. Compute the following

   (i) $\left(\sqrt{-\frac{121}{25}}\right)\times\left(\sqrt{-81}\right)$

   (ii) $\left(\sqrt{-49}\right)\times\left(2-\sqrt{-9}\right)$

4. Perform the following calculations and write the result in the form x + iy

   (i) $(7-i2)-(3+i2)+(7+i3)$

   (ii) $i^{24}+(1+i2)^3$

   (iii) $(\sqrt{3}+i2)(\sqrt{5}+i5)(\sqrt{5}-i5)(\sqrt{3}-i2)$

   (iv) $(1-i)(2-i)(3-i) \,|\, (1+i)(2+i)(3+i)$

5. Show that $\overline{z_1+z_2}=\overline{z_1}+\overline{z_2}$. Verify the result for the following two complex numbers.

   $z_1=\sqrt{3}+i2$

   $z_2=2+i\sqrt{3}$

6. Represent the following complex numbers geometrically.

   (i) $z_1=-3+i$ (ii) $z_2=2+i$

   (iii) z_1+z_2

UNIT - 3

ASSESMENT - II

1. Compute the following

   (i) $\left(\sqrt{-\frac{25}{49}}\right)\times\left(\sqrt{-\frac{14}{36}}\right)$

   (ii) $\left(\sqrt{-4}\right)\times\left(1-\sqrt{-169}\right)$

2. Perform the following calculations and write the result in the form $x + iy$

   (i) $(2+i3)(2-i3)(1+i)^2$

   (ii) $\frac{2-i3}{2+i3}+4-i6$

   (iii) $\frac{(2+i3)(3+i2)}{5+i4}$

3. Find the squares roots of the following complex numbers.

   (i) $1+i$ (ii) $1-i$ (iii) i

4. Show that $i^n + i^{n+1} + i^{n+2} + i^{n+3} = 0$ where $n \in N$.

5. Show that division by z is the same as multiplication by z^{-1} where z is a complex number and z^{-1} is its inverse.

6. Represent the following complex numbers geometrically

   (i) $\sqrt{2}+i\sqrt{3}$ (ii) $\sqrt{3}+i\sqrt{2}$

UNIT - 3

ASSESSMENT - III

1. Find the complex conjugate of the following complex numbers. Write the result in the form $x + iy$

   (i) $(1+i)(2-i3)(1-i)$

   (ii) $(3+i2) \,/\, (3+i)$

2. Perform the indicated operation and write the result in the form $x + iy$

   (i) $i^{9} + i^{11} + i^{13} + i^{15}$

   (ii) $(-1+i\sqrt{3})^{3}$

   (iii) $(2-i3)(2+i) \,/\, (1+i)$

3. Find the square roots of the following complex numbers

   (i) i (ii) $-i$

4. If $z_1 = x-2 + iy + i3$ and $z_2 = ix - y + 1 - i2$

   and if $z_1 = z_2$ find the values of x and y

5. Prove the following results

   (i) $z_1 + (z_2 + z_3) = (z_1 + z_2) + z_3$

   (ii) $z_1(z_2 z_3) = (z_1 z_2) z_3$

6. Show that $1 + i^{22} + i^{226} - i^{1000} = 0$

UNIT - 3

ASSIGNMENT - IV

1. Find the values of x and y if

   (i) $\frac{x}{2} - \frac{y}{3} + i\,\frac{2y}{3} + 2 = i4$

   (ii) $2x - 3y + ix - iy = i9$

2. Simplify to the form x + iy

   (i) $i^{10} + i^{11} + i^{13} + i^{14} + i^{15}$

   (ii) $(2-i) \,|\, (1+i2)^2$

   (iii) $(1+i)\,(2-i3)^2$

3. Find the multiplicative inverse of the following complex numbers. (i) $(-3+i2)$ (ii) $3-i2$

4. Show that

   (i) $\overline{z_1+z_2} = \overline{z_1} + \overline{z_2}$

   (ii) $\overline{z_1-z_2} = \overline{z_1} - \overline{z_2}$

   (iii) $\overline{z_1 z_2} = \overline{z_1}\;\overline{z_2}$

   (iv) $\overline{\left(\frac{z_1}{z_2}\right)} = \frac{\overline{z_1}}{\overline{z_2}}$

5. Find the square roots of

   (i) $2 + i\sqrt{2}$ (ii) $\sqrt{2} + i2$

6. Represent geometrically the following complex numbers.

   (i) $2\sqrt{2} + i3\sqrt{2}$ (ii) $3\sqrt{2} + i2\sqrt{2}$

UNIT - 3

ASSIGNMENT - V

1. Find the values of x and y if

(i) $3x + i(2x - y) = 6 - i3$

(ii) $(3y - 2) + i(5 - 4x) = 0$

2. Do the following calculations. Express the results in the form x + iy

(i) $(7 - i2) - (3 + i2) + (7 + i8)$

(ii) $(1 + i2)(2 + i3)(3 + i4)$

(iii) $(3 + i4)^{-1}$

(iv) $(2 + i)^3 / (3 + i2)$

3. Represent the following complex numbers geometrically

(i) $z_1 = \sqrt{3} + i4$ (ii) $z_2 = 4 + i\sqrt{3}$ (iii) $z_1 + z_2$

4. Compute the following

(i) i^{20} (ii) $\frac{1}{i^{15}}$ (iii) i^{19}

5. Show that

(i) $|z| = |\bar{z}|$

(ii) $|z|^2 = |z^2|$

6. Find the square roots of the following.

(i) i (ii) $-i$ (iii) $1+i$ (iv) $1-i$

<u>UNIT - 4.</u>

<u>ASSESSMENT - I</u>

1. Solve the following equations :

   (i) $2x^2 - (3+i7)x + (-3+i9) = 0$

   (ii) $\sqrt{x+4} - \sqrt{x-2} = \sqrt{4x-17}$

   (iii) $x(x-1)(x-2)(x-3) + 8 = 0$

2. If one root of the equation $ax^2 + bx + c = 0$, $a \neq 0$, is the square of the other, prove that

$$b^3 + a^2c + ac^2 = 3abc$$

3. Form the quadratic equation whose roots are i , $1-i$

4. Without determining the roots of the following equatio comment upon their nature:

   (i) $x^2 - 2\sqrt{5}\,x + 14 = 0$

   (ii) $x^2 - 2x + 1 = 0$

   (iii) $x^{-2} - [illegible] = [illegible]\, x^{-1}$

5. The roots x_1 and x_2 of the quadratic equation $6x^2 + 15 = Kx$ are such that $x_1 - x_2 = \frac{1}{6}$ Determine K.

6. Simplify (i) ω^{45} (ii) ω^{3n+2}, $n \in N$ (iii) ω

7. Prove that $(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11}) =$ [illegible]

ASSESSMENT –

1. Solve the following equations :

(i) $x^2 \quad (3-i2)x + (-5+i5)$

(ii) $\sqrt{2x+5} + \sqrt{5(x-2)} = 3$

(iii) $\dfrac{x-2}{x+1} = \dfrac{x+2}{11x-1}$

2. The roots of the equation

$ax^2 + bx + c = 0$ are in the ratio

$p : q$. Prove that

$$ac\,(p-q)^2 = b^2 pq$$

3. Form the quadratic equation whose roots are

$\frac{3}{5} - \frac{i}{5}$ and $-\frac{3}{5} - \frac{i}{5}$

4. Without determining the roots of the following equations, comment upon their nature:

(i) $\frac{7}{5}x^2 - x + \frac{3}{7} = 0$

(ii) $7x^2 + 6x + 3 = 0$

(iii) $3x^2 + i\,2x - 1 = 0$

5. Determine λ if one of the roots of the equation

$\lambda(x+1)^2 = 5x-7$

is double the other.

6. Show that $\left(\frac{-1+i\sqrt{3}}{2}\right)^n + \left(\frac{-1-i\sqrt{3}}{2}\right)^n = 2$ or -1 according as n is a multiple of 3 or not

7. Hence or otherwise prove that

$$\left(\frac{-1+i\sqrt{3}}{2}\right)^{17} + \left(\frac{-1-i\sqrt{3}}{2}\right)^{17} = -1$$

UNIT – 4.

ASSESSMENT –

1. Solve the following equations :

   (i) $x^2 - (3 - i2)x + (-5 + i5)$

   (ii) $\sqrt{2x + 5} + \sqrt{5(x - 2)} = 3$

   (iii) $\dfrac{x - 2}{x + 1} = \dfrac{x + 2}{11x - 1}$

2. The roots of the equation

   $ax^2 + bx + c = 0$ are in the ratio

   P : q. Prove that

   $$ac(p + q)^2 = b^2 pq$$

3. Form the quadratic equation whose roots are

   $\dfrac{3}{5} - \dfrac{i}{5}$ and $-\dfrac{3}{5} - \dfrac{i}{5}$

4. Without determining the roots of the following equations, comment upon their nature:

   (i) $\dfrac{7}{5}x^2 - x + \dfrac{1}{7} = 0$

   (ii) $7x^2 + 6x + 3 = 0$

   (iii) $3x^2 + i2x - 1 = 0$

5. Determine λ if one of the roots of the equation

   $\lambda(x + 1)^2 = 5x - 7$

   is double the other.

6. Show that $\left(\dfrac{-1 + i\sqrt{3}}{2}\right)^n + \left(\dfrac{-1 - i\sqrt{3}}{2}\right)^n = 2 \text{ or } -1$ according as n is a multiple of 3 or not

7. Hence or otherwise prove that

   $$\left(\frac{-1 + i\sqrt{3}}{2}\right)^{17} + \left(\frac{-1 - i\sqrt{3}}{2}\right)^{17} = -1$$

UNIT - 4.

ASSESSMENT - III

1. Solve the following equations :

   (i) $ix^2 - 4x - 4i = 0$

   (ii) $\sqrt{2(x-1)} - \sqrt{x-3} = \sqrt{x-15}$

   (iii) $4x^2 + 12x + 11 = 0$

2. Form a quadratic equation with real coefficients and with one root $\frac{1}{2} - \frac{\sqrt{2}}{2} i$.

3. If α and β are the roots of the equation $x^2 - px + q = 0$ form the equation whose roots are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$

4. Without determining the roots of the following equations, comment upon their nature :

   (i) $8x - 4x^2 = 1$

   (ii) $19x^2 -$ [illegible] $2 = 0$

   (iii) $x^2 - 2x + 1 = 0$

5. Find the condition that one root of the equation $ax^2 + bx + c = 0, a \neq 0$ is double the other.

6. Prove that $(a-b)(a\omega - b)(a\omega^2 - b) = a^3 - b^3$

7. Prove that $(a+b+c)(a+b\omega+c\omega^2)(a+b\omega^2+c\omega)$

$$= a^3 + b^3 + c^3 - 3abc$$

UNIT - 4.

ASSESSMENT - IV.

1. Solve the following equations:

(i) $2\sqrt{3}\,x^2 - 7x + 2\sqrt{3} = 0$

(ii) $x = 2 + \sqrt{x - 2}$

(iii) $3^{2x+1} + 3^2 = 3^{x+3} + 3^x$

2. Find the condition that the roots of the equation $lx^2 + mx + n = 0$, $l \neq 0$ are in the ratio 3 : 4.

3. If one root of a quadratic equation with real coefficients is -2i -3, find the equation.

4. Determine the value of k such that the equation $x^2 - (3k-1)(x-1) + k^2 - 1 = 0$ has equal roots.

5. Without determining the roots of the following equations, comment upon their nature :

(i) $\frac{1}{7}x^2 + \frac{1}{3}x + 6 = 0$

(ii) $5x^2 - 6x - 9 = 0$

(iii) $\sqrt{3}\,x^2 + 2\sqrt{3}\,x + \sqrt{3} = 0$

6. Prove that $(a + b\omega + c\omega^2)(a + b\omega^2 + c^2 + c\omega)$

$$= a^2 + b^2 + c^2 - ab - bc - ca$$

7. Show that $(1 - \omega + \omega^2)^5 + (1 + \omega - \omega^2)^5 = 32$

UNIT - 4.

ASSESSMENT - V

1. Solve the following equations :

   (i) $x^2 - ([illegible]) x + ([illegible] - i) = 0$

   (ii) $\sqrt{x+5} - \sqrt{x} = 1$

   (iii) $\dfrac{7x^2+1}{x^2-1} - 4\left(\dfrac{x^2-1}{7x^2+1}\right) + 3 = 0$

2. If one root of the quadratic equation $ax^2+bx+c=0$ is the square of the other, prove that

   $$b^3 + a^2c + ac^2 = 3abc$$

3. Determine λ such that the equation

   $12x^2 + 4(\lambda+1)x + 3 = 0$ has equal roots.

4. Form a quadratic equation with real coefficients and with one root $-5i + 1$

5. Without determining the roots of the following equations, comment upon their nature :

   (i) $2x^2 - 10 = x$

   (ii) $(x-a)(x-b) = b^2, \quad b \neq a$

   (iii) $4x^2 - 4\sqrt{5}\,x + 5 = 0$

6. Prove that $\omega^2 + \omega^{10} = -1$

7. Show that $(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11}) = 49$

UNIT - 5

Assessment - 1

1. Solve the following inequations by the algebraic method :

   i) $9x^2 - 3$[illegible]$x +$ [illegible] < 0

   ii) $9x^2$ [illegible] 16 [illegible]

represent the solutions on the number line.

2. Solve the following inequations by the graphical method :

   i) $x^2 - 4x + 1 \geq 0$

   ii) $x^2 - 4$[illegible] ≤ 0

3. The volume V (in cubic inches) of water remaining in a leaking pail after t seconds is given by the equation

$$V = \frac{1}{[illegible]}(t - 1[illegible])^2$$

   i) For what values of t is $V > 1000$?

   ii) For what values of t is $V < 500$?

   iii) When does the leakage stop ?

UNIT - 5

Assessment - II

1. Solve the following inequations by algebraic method :

   (i) $x^2 + [illegible] - [illegible]x \geq 0$

   (ii) $x^2 - [illegible]x - [illegible] \geq 0$

2. Solve graphically the inequations :

   (i) $x^2 - x + 1 \geq 0$

   (ii) $x^2 - [illegible]x \leq 0$

3. Show that k must lie between -1 and 11 if the inequation $9x^2 - (5-k)\ x+1 > 0$. is valid for all real x.

UNIT - 5

Assessment - III

1. Solve graphically :

   (i) $x^2 -$ [illegible] < 0

   (ii) $x^2 + 5x + 6 \geq 0$

2. Solve algebraically :

   (i) $x^2 - 11x +$ [illegible] ≤ 0

   (ii) $4x^2 - 16x + 15 > 0$

3. Show that the graph of the function

   $y = x^2 + kx - x + 9$ is above the x-axis

   if: $-5 < k < 7$

UNIT - 5

Assessment - IV

1. Solve graphically

   (i) $x^2 - 6x + 10 < 0$

   (ii) $x^2 + 5x + 6 \geq 0$

2. Solve algebraically

   (i) $x^2 - 11x + 28 \leq 0$

   (ii) $4x^2 - 16x + 15 \geq 0$

3. Making use of inequation, find the area of the largest rectangle with perimeter 144 cms.

UNIT – 5

Assessment – V

1. Solve algebraically :

   (i) $9x^2 - 6x + 1 > 0$

   (ii) $x^2 - 4x > 8$

2. Solve graphically :

   (i) $6x^2 + 13x + 6 \leq 0$

   (ii) $3 - 5x < x^2$

3. Show that k must lie between -11 and 1 if the inequation $9x^2 - (5+k)X + 1 > 0$, is valid for all real x.

UNIT 6

ASSESSMENT - I

1. Name the two fundamental processes of reasoning commonly employed.
2. State the axiom of the Principle of Mathematical Induction.
3. Prove the following results using the Principle of Mathematical Induction,

   n being a natural number.

   (a) $2^2+4^2+6^2+\ldots\ldots\ldots(2n)^2 = \frac{2n(n+1)(2n+1)}{3}$

   (b) 3^n-1 is divisible by 2.

   (c) The sum of the angles of a polygon is $(n-2)\times 180^0$, n being the number of sides of the polygon.

UNIT - 6

ASSESSMENT - II

1. When we proceed from general to particular, the process of reasoning will be called____________.

2. According to the Principle of Mathematical Induction a statement is true for all natural number if

   (i) ----------------------, and

   (ii) ----------------------

3. Prove the following results by using the Principle of Mathematical Induction ; n being a natural number.

   (a) $2+4+6.......+2n = n(n+1)$

   (b) $2^{2n}-1$ is divisible by 3.

   (c) $x^{2n+1} + y^{2n+1}$ is divisible by $x+y$ where $x+y \neq 0$.

UNIT - 6

ASSESSMENT - III

1. When we proceed from particular to general the p process of reasoning is called -------------.

2. State the two conditions that a given statement in natural numbers must satisfy so that it can be true for all natural numbers.

3. Prove the following by using the Principle of Mathematical Induction n being a natural number.

   (a) $n(n+1)(n+2)(n+3)$ is divisible by 24 for all natural numbers n.

   (b) $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \frac{1}{n.(n+1)} = \frac{n}{n+1}$

   (c) $x^n - y^n$ is divisible by $x-y$ for every natural number n, where $x-y \neq 0$.

UNIT - 6

ASSESSMENT - IV

1. Put an arrow in the correct directon to indicate the process of reasoning :

   (a) Induction General ....Particular

   (b) Deduction : General.....Particulat

2. If a statement P9n) is true for all natural numbers n, then

   (i) P(1) is ...., and

   (ii) If P (k) is ...., then ....must

3. Prove the following by using Mathematical induction, n being a natural number.

   (i) $1+2+3+........+n = \frac{n(n+1)}{2}$

   (ii) $3^{3n} - 1$ is divisible by 26.

UNIT - 6

ASSESSMENT -V

1. 'All triangles are rigid figures, therefore, an equilateral triabgle is a rigid figure.' This reasoning has followed from the process of________ (Induction/deduction) because we have proceeded from__________to__________.

2. What are the two conditions, a given statement must satisfy in order to be time for all natural numbers ?.

3. Prove the following using the Principle of Mathematical Induction, n being a natural number.

(a) $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \cdots + \frac{1}{(2n-1)\ (2n-1)}$

(b) $7^n - 1$ is divisible by 6.

(c) If $x > -1$ $(1+x)^n \geq 1+nx$.

UNIT – 7

ASSESSMENT – I

1. How many 3 digit even numbers can be formed from the digits 2, 3, 4, 7, 9, when

   i) the digit can be repeated

   ii) the digits can not be repeated.

2. Evaluation. $\frac{n!}{(n-r)!\,r!}$ when n=12, r=15

3. Prove that the number of permutations of n different objects, taken all at a time is $n!$

4. Find r if

$$^{11}P_{r+1} : {}^{11}P_{r} = 30 : 11$$

5. In how many different ways can the letters of the word 'KURUKSHETRA' be arranged ?

6. In how many ways can 10 people line up at a ticket window of a cinema hall ?

UNIT -7

ASSESSMENT -II

1. Evalute : $\dfrac{(n-1)!\,(r+2)!}{r!\,(n-r)!}$ where $n = 5$, $r = 2$.

2. Prove that the number of permutations of n objects, of which m are of one kind and $(n-m)$ of another kind, taken all at a time is $\dfrac{n!}{m!\,(n-m)!}$

3. Determine the number of ways in which 4 books one each in Physics, Hindi, Maths and English, be arranged on a shelf.

4. Determine n if

$$^{n}P_{4} = 20\,{}^{n}P_{2}$$

5. Determine the number of different 5 letter words formed from the letters of the word ' EQUATION '.

6. Five identical coins are arranged in a row, determine the number of ways in which 3 heads and 2 tails can appear.

UNIT [illegible]

ASSESSMENT – III

1. **Evalute :**

$$\frac{(n-r+1)!}{(n-r)!\,(r+1)!}$$ when $n = 7$, $r = 3$.

2. Prove that the number ${}^{n}P_{r}$ of permutations of n different objects, taken r at a time $(r \leq n)$ is $\frac{n!}{(n-r)!}$

3. Determine n if

$${}^{n}P_{6} = {}^{2n}P_{5}$$

4. How many 3 digit numbers each less than [illegible]00 can be formed from the digits 1, 2, 3, 4, 5, and 6 if repetition of digits allowed.

5. In how many ways can 6 boys and 5 girls be arranged for a 'COMMUNICATIONS' be arranged?

6. In how many ways can 6 boys and 5 girls be arranged for a groups photograph if the girls are to sit on chairs in a row and boys are to stand in a row behind them.

UNIT – 7

ASSESSMENT – IV

1. Determine n if

$$ {}^{n}P_{r} \quad {}^{n+1}P_{r} = 1 : 2 $$

2. Evalute : $\dfrac{(n-2)!\,(r+2)!}{(n-r+1)!\;r!}$ when $n = 8$, $r = 2$

3. Prove that

$$ {}^{n}P_{r} = {}^{n-1}P_{r} + r\left({}^{n-1}P_{r-1}\right) $$

for all natural number n and r for which the symbols are defined.

4. Twelve students compete in a race. In how many ways can the first four places be taken ?

5. There are 6 red, 4 white and 2 black balls in a box. All the 12 balls are arranged in a line, determine the number of different arrangements.

6. How many of the numbers from 1 to 1000 have none of their digits repeated.

UNIT – 7 –

ASSESSMENT – V

1. Find the value(s) of n such that $5\,{}^{n}P_{6} = {}^{n+2}P_{7}$

2. Evalute $\dfrac{(n-r)!\,(r+1)!}{(n-r+1)!}$ when n =5, r = 2.

3. Prove that the number of permutations of n objects, of which m are of one kind and (n–m) of another kind, taken all at a time is $\dfrac{n!}{m!\,(n-m)!}$

4. How many integers between 1000 and 10000 have no digits other than 3,7,9.

5. There are 10 entries in a certain contest. In how many ways can the first three prizes be awarded ?

6. In how many different ways can the letters of the word 'CALCUTTA' be arranged ?

UNIT – 8
Assessment -1

1. Prove that ${}^{n}C_{r} = {}^{n}C_{n-r}$

2. Evaluate :

   (i) ${}^{[illegible]}C_{16} - {}^{30}C_{2k}$

   (ii) ${}^{[illegible]}C_{198}$

3. Determine n if ${}^{2n}C_{3} : {}^{n}C_{3} = 12 : 1$

4. In how many ways can 11 distinct objects be divided into two groups containing respectively 5 and 6 objects ?

5. A committee of 4 has to be selected from among 6 boys and 5 girls. The committee is to include at least 1 boy and at least 1 girl. In how many ways can we select the committee?

6. How many straight lines can be drawn through 5 coplanar points (given that no 3 points are collinear) ? Deduce that number of triangles through these points are the same as the number of lines. (Verify your answer by taking 5 points as A, B, C, D and E. Name the lines and triangles thus obtained).

UNIT - 8

Assessment - II

1. If n and r are natural numbers such that

   $1 \leq r \leq n$ show that

   $$^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}$$

2. If $^{n}C_{10} = {}^{n}C_{2}$ determine $^{n}C_{20}$

3. In how many ways can a hocky team of 11 be selected out of 16 players. How many of them will contain a particular player.

4. A boy contain 4 white and 5 black balls. 5 balls are drawn. Determine the number of ways in which 3 white and 2 black balls can be drawn.

5. How many 5 digit numbers each greater than 23000, can be formed using the digits 1, 2, 3, 6 and 7 ? (Assuming of digits not allowed).

6. If $\dfrac{^{n}C_{r}}{^{n}C_{r+1}} = \dfrac{1}{1}$ and $\dfrac{^{n}C_{r+1}}{^{n}C_{r+2}} = \dfrac{2}{3}$

   determine the values of n and r.

UNIT - 8
Assessment - IV

1. If n and r are natural numbers such that $1 \le r \le n$ show that

$$r \, {}^{n}C_{r} = (n-r+1) \, {}^{n}C_{r-1}$$

2. Evaluate : ${}^{19}C_{17} + {}^{19}C_{18}$

3. Prove that the number of ways in which n different books can be arranged on a helfs so that a particular two of them are not together is $(n-1)!\,(n-2)!$

4. A question paper consists of 12 questions divided into two sections A and B. Section A contains 7 questions and section B contains 5 questions. A candidiates is required to attempt 7 questions selecting at least 3 from each sections. In how many ways can the candidate select the questions ?

5. How many triangles can be formed by joining 11 points, 5 of which are collinear.

6. A committee of 5 is to be selected from 7 boys and 8 girls. Determine the number of ways of selecting the committee, if it to consist of at least 1 boy and 1 girl.

UNIT . 9

Assessment - I

1. Expand $\left(\frac{3x}{2} - \frac{2y}{3}\right)^4$

2. Find the middle term in the expansion of

$$\left(\frac{3x}{4} + \frac{4y}{3}\right)^6$$

3. Find the co-eff. of in the expansion of

$$\left(y^{\frac{1}{2}} + y^{-\frac{1}{3}}\right)^{16}$$

4. Find the value of

$${}^{20}C_1 + {}^{20}C_3 + {}^{20}C_5 + \cdots + {}^{20}C_{19}$$

5. Expand to four terms

$$\left(1 - \frac{1}{2}y\right)^{-\frac{1}{2}}$$

6. Find the value of $\sqrt{105}$ correct to 4 places of decimal.

7. If x is so small that its square and higher powers are neglected find the approximate value of

$$\frac{(1-x)^{\frac{1}{3}} + (1-5x)^2}{\sqrt[4]{16-x}}$$

UNIT - 9

Assessment - II

1. Expand $(3x - 2y)^6$

2. Find the two middle terms in the expansion of

$$\left(x + \frac{1}{x}\right)^9$$

3. Find the co.eff. of x^{11} in the expansion of

$$(x - 2y)^{13}$$

4. State and prove Binomial theorem for positive integral exponent.

5. Prove that

$$\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{C_2} + \qquad + n\frac{C_n}{C_{n-1}} = \frac{n(n+1)}{2}$$

6. Find the value of $\sqrt[3]{1001}$ to 4 places of decimal

7. If x is so small that its square and higher powers of x may be neglected prove that

$$\frac{\sqrt{1-3x} + \sqrt[3]{(1-x)^5}}{\sqrt{4-x}} = 1 - \frac{35}{24}x$$

<u>UNIT - 9</u>

<u>Assessment - III</u>

1. Expand $\left(\frac{2x}{3} - \frac{3}{2x}\right)^6$

2. Find the 4th term in the expansion of $(x^2 - y^3)^{12}$

3. Find the term independent of x in

$$\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$$

4. If $C_0, C_1, C_2 \ldots C_n$ are the Binomial co-officients in the expansion of $(1+x)^n$ find the value of

$$C_0 - \frac{1}{2}C_1 + \frac{1}{3}C_2 - \frac{1}{4}C_3 \ldots (-1)^n \frac{C_n}{n+1}$$

5. Find the co-eff. of y^{10} in the expansion of

$$(1 - 2y^2)^{-\frac{5}{2}}$$

6. Find the value of $\sqrt[7]{127}$ to 4 places of decimal.

7. If n is so small that square and higher powers of n may be neglected, prove that

$$\frac{\sqrt{1+n} + \sqrt[3]{(1-n)^2}}{(1+n) - \sqrt{1+n}} = 1 - \frac{5n}{6}$$

UNIT - 9

Assessment - IV

1. Expand $(1 + x + x^2)^4$

2. Find the middle term of $\left(x + \frac{1}{x}\right)^{2n}$

3. Find the co-eff. of x^6 in the expansion of

$$(1 + x + x^4 + x^5)^7$$

4. $C_0, C_1, \ldots C_n$ are the Binomial co-efficient in the expansion of $(1 + x)^n$

Find the value of

$$C_0 + 2C_1 + 3C_2 + 4C_3 + \ldots (n+1)C_n$$

5. State and prove Binomial Theorem for positive integral exponent.

6. Find the 5th root of 35 to 5 places of decimal.

7. Find the Co-eff. of x^{10} in the expansion of

$$(1 - 2x^2)^{-\frac{5}{2}}$$

UNIT - 9

Assessment V

1. Expand $(1 - x + x^2)^4$

2. Find the term independent of x in

$$\left(\sqrt{x} - \frac{3}{x^2}\right)^{10}$$

3. If the 2nd, 3rd, 4th, term in the expansion of $(a+x)^n$ are 240, 720, 1080 resp find a, x, n.

4. If $C_0, C_1, C_2 \dots C_n$ be the co-efficient in the expansion of $(1+x)^n$ find the value of

$$C_0C_2 + C_1C_3 + C_2C_4 + \dots + C_{n-2}C_n$$

5. Find the 8th term in the expansion of

$$(1-2x)^{-\frac{3}{2}}$$

6. Find the cube root of 998 to five places of decimal.

7. If x is so small that its square and higher powers may be neglected, prove that

$$\frac{(9+2x)^{\frac{1}{2}}(3+4x)}{\sqrt[5]{1-x}} = 9 + \frac{74}{5}x$$

UNIT-10

Assessment-I

1. Which of the following relations are functions? For the functions specify their domains.

(i) $y^2 = x + 3$ (ii) $y = 2x^2 - 7$

(iii) $y = \frac{1}{x - 2}$ (iv) $y = |x|$

2. Classify the following functions as even or odd or neithe

(i) $y = \frac{x^2 - 1}{x + 1}$ (ii) $y = 3x^4 - 5x^2$

(iii) $y = |x| + x$ (iv) $y = x^3 - x$

(v) $y = \frac{3x^2 - y - 2}{x - 1}$

3. Show that the function $y = 1/x$ is a one-one function.

4. Form, if possible, the inverse of each of the following functions:

(i) $y = x + 2$ (ii) $y = x^2 + 2x$

(iii) $y = x - 1/x + 2$ (iv) $\{(x_1, y_1), (x_2, y_2), (x_3, y_3)$

5. Given $f(x) = 3x^2 - 2x + 1$

$g(x) = -x$

Find

(i) $(f + g)x$ (ii) $(f . g)x$

(iii) $(f \circ g)x$ (iv) $(g \circ f)x$

UNIT - 10

Assessment-II

1. Write the domain and the range for each of the following functions

   (i) $y = x - 4$ (ii) $y = \frac{1}{x + 4}$

   (iii) $y = 2x^2 - 3x + 5$ (iv) $y = x^5$

2. Show that the function

   $y = 5x^2 - 3x + 7$ is neither even nor odd, Is this a polynomial function?

3. (a) Which of the functions in Q. 1 are polynomial functions Which of them are rational?

   (b) Is $y = \sqrt{x^2 - 16}$ a real function for all values of x? Give reasons for your answer.

4. Define a one-one function. Find if the following are one-one functions -

   (i) $y = x$ (ii) $y = |x|$.

   (iii) $y = 3x + 5$ (iv) $y = 2x^2$

5. Form, if possible, the inverse of each of the following functions:

   (i) $y = 10-3x$ (ii) $y = 2x^2 + x - 4$

   (iii) $y = \frac{3x+1}{x-2}$

6. Given

   $f(x) = 2x^2 - 3x$

   $g(x) = 2x-3$

   $h(x) = x-1$

   Find

(i) $(f + h)x$ (ii) $(g-h)x$ (iii) $(f \circ h)x$ (iv) $(h \circ g)x$

7. Draw the graphs of the following functions:

(i) $y = x + [x]$

(ii) $y = \begin{cases} -3 & \text{for } x < -3 \\ x & \text{for } -3 \leq x < 0 \\ x + 2 & \text{for } 0 \leq x \end{cases}$

8. Find the elements of f given $y = f(x) = 2x - 1$, if

$f : X \rightarrow Y$ is such that

$X = \{1, 3, 5, 7\}$

$Y = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$

UNIT-10

Assessment-III

1. Which of the following relations are functions? For the functions specify their domains.

   (i) $y = \pm\sqrt{3x+2}$ (ii) $y = \dfrac{x^2 - 3x + 2}{x + 2}$

   (iii) $y = \dfrac{1}{x}$ (iv) $y = |x| + x$

2. Classify the following functions ase even or odd or neither.

   (i) $y = 3x^3 + 7x$ (ii) $y = (7 + x)^2$

   (iii) $y = \dfrac{x^2 + 3}{x^2 - 3}$ (iv) $y = x^5 - 6x$

3. Which of the functions in the above Qs 1 and 2 are polynom Which of them are rational functions?

4. Show that the function

$$y = \frac{1}{3x + 2}$$

   Is a one-one function,

   What is the restriction on the domain of y?

5. Find the equations that define the inverse of the functions defined by the following

   (i) $y = 7x + 4$ (ii) $y = \dfrac{1}{x}$

   (iii) $y = \dfrac{x - 4}{5 - x}$

6. Given $f(x) = \dfrac{1}{x+3}$ and $g(x) = 2x + 5$

   Find

   (i) $(f \circ g)x$ (ii) $(g \circ f)x$

   (iii) $(f \cdot g)x$ (iv) $(g \circ f)x$

7. Draw the graphs of the following functions

   (i) $y = 6x^2 + x - 5$ (ii) $y = \begin{cases} x \text{ for } x \leq 3 \\ 3 \text{ for } 3 < x < 5 \\ x \text{ for } x \geq 5 \end{cases}$

8. A is a set of postal parcels of different weights and B is the set of numbers giving postages required for the parcels. Does this define a function.

9. Find the converse of the following functions:

$$A_1 = \{(1,2), (2,4), (3,6), (4,8)\}$$

$$A_2 = \{(1,2), (2,2), (3,8), (4,8)\}$$

$$A_3 = \{(1,8), (2,8), (3,8), (4,8)\}$$

Which of them are functions and which are not functions. Give reasons.

Assessment-IV

1. Define a function.

   Which of the following relations are functions? Specify the domain for the functions.

   (i) $y = 2x^2 - 3x + 2$ (ii) $y^2 = 3x + 5$

   (iii) $y = \dfrac{2x + 3}{2x - 3}$

2. Show that

   (i) $y = |x|$ is an even function.

   (ii) $y = x^3 - 4x$ is an odd function.

   (iii) $y = 3x + 2$ is neither even nor odd.

3. Give one example each of

   (i) a polynomial function

   (ii) a rational function

4. Show that the function $y = \dfrac{2}{x}$ is a one-one function.

5. Find the equations that define the inverses of the functions defined by the following equations

   (i) $y = 7 - 3x$ (ii) $y = x^2 - 3x + 2$

   (iii) $y = \dfrac{x - 2}{2x + 5}$

6. Given $f(x) = x^2 - 3x + 2$; $g(x) = x - 1$

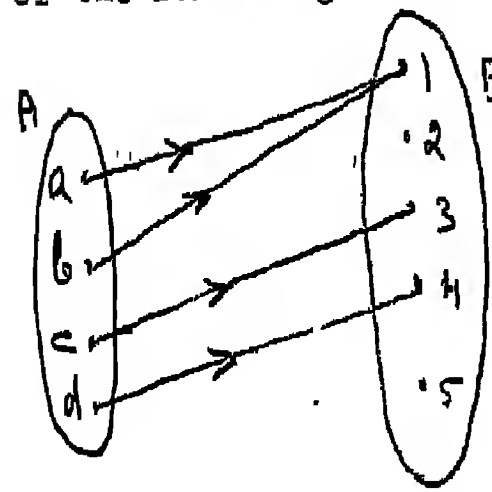
   Find
   (i) $(f - g)x$ (ii) $(f \div g)x$ (iii) $(f \circ g)x$

7. Draw the graphs of the following functions

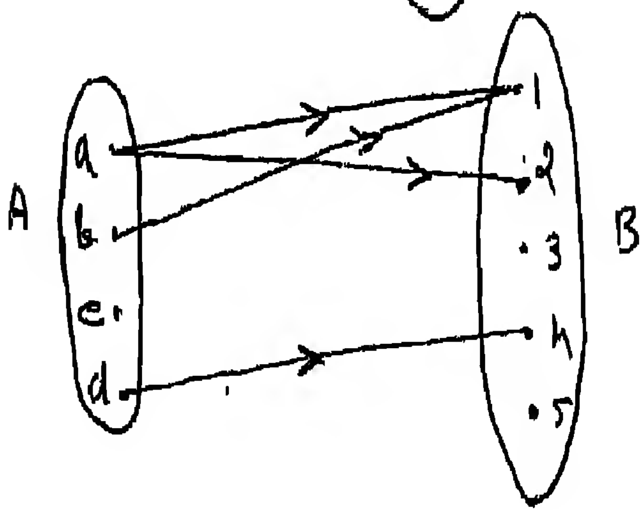
   (i) $y = \dfrac{x}{|x|}$ (ii) $y = \begin{cases} -2 & \text{for } x \leq -2 \\ x & \text{for } -2 < x < 2 \\ 2 & \text{for } x \geq 2 \end{cases}$

8. Which of the following arrow diagrams are functions.

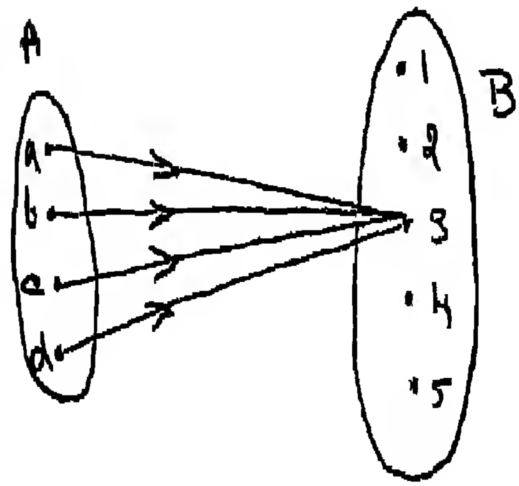
(i)



(ii)



(iii)



UNIT - 10

Assessment -V

1. A is a set of all students of a class and B is the set of marks obtained by them out of 100 in mathematics. Does this define a function.

2. Which of the following sets of ordered pairs are functions:

(i) $\{(x_1, y_1), (x_2, y_2), (x_3, y_3) \ldots\ldots.(x_n, y_n)\}$

(ii) $\{(x,y), (y,z), (z,x), (x,z)\}$

(iii) $\{(1,10),(2,11), (3,12), (4,13)\ldots\ldots\}$

(iv) $\{(1,10),(1,11),(1,12), \ldots\ldots\ldots(1,20)\}$

3. Which of the following relations are functions. Specify the domain for the functions

(i) $y = \frac{1}{x^2}$

(ii) $y = ax^2 + bx + c$

(iii) $y^2 = ax + b$

(iv) $y = \pm x$

4. Classify the following functions as even or odd or neither.

(i) $y = x^3 - 2x$

(ii) $y = \frac{x^2 + 3}{x^2 - 3}$

(iii) $y = x + |x| + [x]$

(iv) $y = \frac{3x^2 - x - 2}{x - 1}$

5. Find the inverse (if possible) of the following functions

(i) $y = \frac{x - 1}{x + 2}$

(ii) $y = 3x^2 - 7x + 2$

(iii) $y = \frac{1}{x}$

(iv) $\{(x_1, y_1), (x_2, y_2), (x_3, y_3) \ldots\ldots\ldots(x_n, v_1)\}$

6. Given $f(x) = \frac{1}{x + 3}$ and $g(x) = 2x^2 - 3x$ find

(i) $(f+g)x$ (ii) $(f-g)x$, (iii) $(f \cdot g)x$ (iv) $\left(\frac{f}{g}\right)x$

(v) $\left(\frac{g}{f}\right)x$ (vi) $(f \circ g)x$ (vii) $(g \circ f)x$

7. Draw the graphs of the following functions

(i) $y = f(x) = \begin{cases} 0 & \text{for } x < 0 \\ 1 & \text{for } x \geq 0 \end{cases}$

(ii) $y = f(x) = \begin{cases} 1 & \text{for } x = a \\ 0 & \text{fpr } x \neq a \end{cases}$

(iii) $y = f(x) = 3x^2 = 2x + 2$

(iv) $y = f(x) = x + |x| + [x]$

UNIT - IX

Assessment - I.

1. In a circle of diameter 40 cm., the length of a chord is 20 cm. Find the length of the minor arc of the chord.

2. If θ is acute, and $\cos \theta = \frac{1}{2}$, find $\cos 2\theta$. Explain the meaning of sign in your answer.

3. If $A+B+C = \pi$, prove that

$$\cos^2 \frac{A}{2} + \cos^2 \frac{B}{2} - \cos^2 \frac{C}{2} = 2 \cos \frac{A}{2} \cos \frac{B}{2} \sin \frac{C}{2}$$

UNIT - II

Assessment - II

1. If in two circles arcs of the same length subtend angles 60^0 and 75^0 at its centre, find the ratio of their radii.
2. Show that $\cos 70^0 \cos 10^0 + \sin 70^0 \sin 10^0 = \frac{1}{2}$
3. If $A+B+C = \pi$, prove that

$$\cos A + \cos B - \cos C = 4 \cos \frac{A}{2} \cos \frac{B}{2} \sin \frac{C}{2} - 1.$$

UNIT - 11

Assessment - III

1. Through how many radians does the minutes hand of a clock move in 39 min. ?

2. Prove the identity

   $\tan 3\theta \tan 2\theta \tan\theta = \tan 3\theta - \tan 2\theta - \tan\theta$

3. If $A+B+C = \pi$, prove that

   $\sin A + \sin B - \sin C = 4 \sin \frac{A}{2} \sin \frac{B}{2} \cos \frac{C}{2}$

UNIT - II

Assessment - IV

1. Find the radius of a circle in which an arc 165 miles long subtends a central angle of 3 radians.

2. Prove the identity

$$\cos 7\theta + \cos 5\theta + \cos 3\theta + \cos \theta = 4 \cos \theta \cos 2\theta \cos 4\theta$$

3. If $A+B+C = \pi$, prove that

$$\cos 2A + \cos 2B + \cos 2C = -1-4 \cos A \cos B \cos C$$

UNIT - II

Assessment - V

1. Prove the following

(i) $(\text{sni}\ \theta + \cos\theta)^2 = 1 + \sin 2\theta$

(ii) $\sqrt{\dfrac{1 - \text{sni}\ \theta}{1 + \text{sni}\ \theta}} = \sec\theta - \tan\theta$

(iii) $\sqrt{\dfrac{1 + \cos\theta}{1 - \cos\theta}} = \sec\theta + \tan\theta$

2. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$ prove that $m^2 - n^2 = \pm 4\sqrt{mn}$

3. If $A+B+C = \pi$ prove that

$\cot\dfrac{A}{2} + \cot\dfrac{B}{2} + \cot\dfrac{C}{2} = \cot\dfrac{A}{2}\cot\dfrac{B}{2}\cdot\cot\dfrac{C}{2}$

UNIT - 12

ASSESSMENT - 1

1. (a) Prove that the general expression for all angles having same cotangent as θ is given by

$$\theta = n\pi + \alpha \qquad \text{where } n \in I$$

and α is the smallest +ve or -ve angle having same cotangent as θ

(b) Solve for θ given $\cos\theta = 1/\sqrt{2}$

2. Prove for Δ ABC

$$(c + a)\tan\left(\frac{C-A}{2}\right) = (c-a)\tan\left(\frac{C+A}{2}\right)$$

3. Solve for θ; $\tan 5\theta = \cot\theta$

4. A path up a hillside consists of two straight portions AB and BC. AB is 70 meters long and inclined at 60° with horizontal while BC is 50 metre long inclined at 30° with horizontal. Calculate the vertical height of C above point A.

UNIT – 12
Assessment – II

1. (a) Find the general expression for all angles which have a given cosine.

   (b) If $\sin \theta = \sqrt{3}/2$ write down all possible values of θ satisfying the equation.

2. Solve, $\tan x + \tan 2x + \tan x \tan 2x = 1$

3. In a $\triangle ABC$ prove that

   $a^2 = b^2 + c^2 - 2bc \cos A$

4. The angles of elevation of the top of a tower from two points distant 150 metres and 100 metres from the foot of the tower and in the same straight line with it are supplementary. Prove that the height of the tower is $50\sqrt{6}$ metres.

UNIT -12

ASSESSMENT -III

1. (a) Find general expression for all angles having same tangent

(b) If $\tan 2\theta = 1/3$, find general valus of θ .

2. Solve the Equation $\operatorname{cosec} x = 1 + \cot x$

3. Prove that $a^2 \sin 2B + b^2 \sin 2A = 2ab \sin C$.

4. At the foot of a mountain the elevation of its summit is found to be 45^0, after ascending one kilometer towards the mountain up a slope of 30^0 inclination, the elevation is found to be 60^0. Find the hight of the mountain.

UNIT - 12

Assessment - IV

1, (a) Find general expression for all angles having same sine.

Hence deduce the result for the case of cosec also,

(b) Solve for x when

$$\sec^2 x = \sec^2 \alpha$$

2, Find θ which satisfied the equation,

$$\sin 5\theta - \sin 6\theta + \sin 7\theta - \sin 8\theta = 0.$$

3, In $\triangle ABC$, $\angle C = 60^0$ prove that

(i) $a^2 + b^2 = c^2 + ab$

(ii) $\dfrac{1}{a+b} + \dfrac{1}{b+c} = \dfrac{3}{a+b+c}$

4, A spherical ball of diameter d subtends an angle α at a man's eye when the elevation of its centre is β.

Prove that the height of the centre of the ball is given by

$$\frac{d}{2} \sin \beta \operatorname{cosec} \frac{\alpha}{2}$$

UNIT -12

ASSESSMENT $\frac{3}{4}$ V

1. (a) Give only answers

   i) Expresssion for all angles whose sin is zero.

   ii) Common value of θ satirfying the equation

   $\sin\theta = \frac{1}{2}$ and $\tan\theta = 1/\sqrt{3}$

2. Solve for x the equation

   $\cos x + \sin x + 1 = 0$

3. The sides of a Δ are $x^2 + x + 1$, $2x + 1$ and $x^2 - 1$

   Find the greatest angle of the Δ.

   (Hint : $x^2 + x + 1$ is the greatest side as $x > 1$ to make $x^2 - 1$ a meaningful value of a side)

4. Two stations due south of a tower which leads towards north are at distances a and b from its foot. If α and β be the elevations of the top of the tower from these points respectively and the tower is inclined at an angle γ with the horizontal then prove that

$$\cot\gamma = \frac{b\cot\alpha - a\cot\beta}{b-a}$$

UNIT -13

ASSESSMENT -I

1. Find the equation of the line through the intersection of $5x - 3y = 1$ and $2x + 3y = 23$ and is parallel to the line $5x - 4y - 20 = 0$

2. Find the equation of the locus of the point which moves so that the sum of the squares of their distances form $(3,0)$ and $(-3,0)$ is equal to 9.

3. Give an analytical proof to show that the diagonal of a square are perpendicular to each other.

UNIT -13
ASSESSMENT -11

1. Find the equation of the line through theintersection of the lines $x + 2y - 3 = 0$ and $4x - y \quad 7 = 0$ and which is perpendicular to $4x - 5y - 20 = 0$.

2. Find the equation of the   of the point P (x, y) such that its distance from the point $(-3, 4)$ is greater than 25.

3. Prove that the diagonals of a parallelogram bisect each other.

UNIT -13

ASSESSMENT -III

1. Find the locus of thepoint A (x,y) such that $|AB| - |AC| = 12$ where B and C are the points (0,3) and (0,-3) respectively.

2. Find the equation of the line through the intersection of the lines $3x + 2y - 8 = 0$ and $y - 4x + 4 = 0$ and perpendicular to the line $2x + y - 7 = 0$

3. Prove that in any triangle, four times the sum of squares of the medians is equal to three times the sum of squares of the sides.

UNIT -13

ASSESSMENT - IV

1. Find the equation of the line through the intersection of the lines $x + y + 2 = 0$ and $2x + y + 5 = 0$ and perpendicular to the line $x - y + 2 = 0$.

2. Give an analytical proof to show that the diagonal of a square are perpendicular to each other.

3. Find the equation of the locus of the point $P(x, y)$ such that the sum of its distance from $(0, 4)$ and $(0, -4)$ is 12.

UNIT -13

ASSESSMENT -V

1. Show that two points (2a ,4a) (2a,6a) and ($2a+\sqrt{3}a$, $5a$) are the vertices of an equilateral triangle whose side is 2a.

2. The sum of the distance of a point from two fixed points A (- ae, 0) and B (ae, o) is 2a. Find its locus.

3. A line is drawn through the point P(2,1) parallel to the line $x-y+1=0$ to meet the line $2x-y=\sqrt{2}$ at Q. Find the distance PQ.

UNIT - 14

Assessment - I

1. Find the equation of the tangent and normal to the circle $x^2+y^2-4x+6y+8=0$ at $(1,-1)$

2. Find the equation of the family of circles through the intersection of the circles $x^2+y^2-10x+8y=8$, $x^2+y^2+14x-4y=-4$.

3. Find the parametric representation of the circle $2x^2+2y^2-4x-6y=3$

UNIT - 14

Assessment - II

1. Find the equation of the tangent and normal to the circle $2x^2+2y^2+x+3y = 0$ at $(0,0)$

2. Find the equation of the circle through the intersections of the circles

   $x^2+y^2-10x+8y = 89$ and $x^2+y^2+14x-4y = -4$

   and passing through the point $(0,0)$

3. Represent the circle parametrically with centre at $(2,3)$ and radius 3.

UNIT - 14

Assessment - III

1. Find the equation of the tangent and normal to the circle $x^2+y^2 = 13$ at $(-2, 3)$

2. Find the equation of the circle through the intersections of the circles

   $x^2+y^2 - 2x + 4y = 4$ and

   $x^2 + y^2 + 4x - 6y = 3$

   and passing through $(2, 1)$

3. Represent the circle $x^2+y^2+8x-10y+5 = 0$, parametrically

UNIT - 14

Assessment - IV

1. Find the equation of the tangent and normal to the circle $(x-1)^2 + (y-2)^2 = 13$, at $\left(-\frac{10}{3}, 2\right)$

2. Find the radical-axis of the circles
$x^2+y^2 = 5$ and $x^2+y^2-6x+4 = 0$

3. State the centre and radius of the circle represented by $x = 2+\cos\theta$ and $y = -1+\sin\theta$

UNIT - 14

Assessment - V

1. Find the equations of the tangent and normal to the circle $x^2 + y^2 - 6x + 1 = 0$ at the point $(0,1)$

2. Find the radical axis of the circles
$x^2 + y^2 + 2g_1 x + 2 f_1 y + c_1 = 0$ and $x^2 + y^2 + 2 g_2 x + 2 f_2 y + c_2 = 0$

3. Find the centre and radius of the circle
$x = 2 + \cos\theta$ and $y = 3 + \sin\theta$

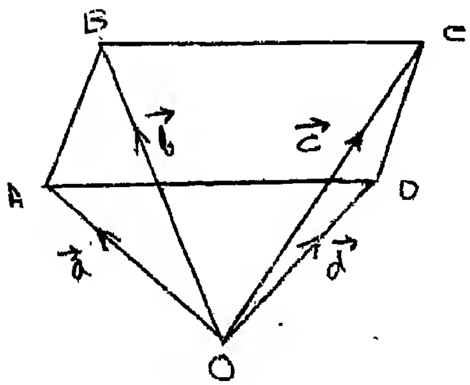
UNIT – 15

Assessment – 1

1. Which of the following have representations as vector (a) Weight (b) Specific heat (c) Momentum (d) Energy (e) Speed (f) Velocity (g) Magnetic field intensity (h) Gravitational force (i) Kinetic energy (j) Age.

2. An air plane travels 200 km north and then 100 km. 60° north of west. Determine the resultant displacement graphically.

3. If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of the vertices A, B, C of a parallelogram ABCD, find the position vector of D.



4. Show that the points (2, -1,3), (3,-1,1), (-1,11,19) are collinear (Use vector method)

5. Prove that the medians of a triangle are concurrent.

6. If $\vec{a}$ and $\vec{b}$ are two vectors represented by OA and OB and if C is a point in AB such that.

AC : CB = $\mu : \lambda$ where μ and λ are real numbers then show that

$\lambda \vec{a} + \mu \vec{b} = (\lambda+\mu)\vec{c}$ where $\vec{c} = \overrightarrow{OC}$

UNIT -15

Assessment -II

1. Which of the following are scalars

(i) Mass (ii) Energy (iii) Time (iv) Work (v) Power (vi) Weight (vii) Displacement.

2. Prove that vector addition is commutative.

3. ABCD is a quadrilateral in which H, K are the mid points of BC, AD respectively, show that $\overrightarrow{AB} + \overrightarrow{DC} = 2\overrightarrow{KH}$.

4. Prove that a quadrilateral is a parallelogram if its diagonals bisect each other.

5. Prove that $K(\vec{a}+\vec{b}) = K\vec{a} + K\vec{b}$.

6. The position vectors of the points A, B, C and D are $4\vec{i} + 3\vec{j} - \vec{k}$, $5\vec{i} + 2\vec{j} + 2\vec{k}$, $2\vec{i} - 2\vec{j} - 3\vec{k}$ and $4\vec{i} - 4\vec{j} + 3\vec{k}$ respectively. Show that AB and CD are parallel.

UNIT -15

Assessment - III

1. Prove that $|\vec{a}+\vec{b}| \leq |\vec{a}|+|\vec{b}|$

2. Prove that the vector addition is associative.

3. Find the unit vector in the direction of the vector $\vec{r_1}-\vec{r_2}$ where $\vec{r_1} = \vec{i} + 2\vec{j} - \vec{k}$ and $\vec{r_2} = 3\vec{i} + \vec{j} - 5\vec{k}$

4. If the vectors $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ represent the consecutive sides of a quadrilateral; show that necessary and sufficient conditions that the quadrilateral be a parallelogram is that $\vec{a} + \vec{c} = 0$ and $\vec{b} + \vec{d} = 0$.

5. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three vectors whose components are $(3,4)$ $(-2,5)$ and $(1,3)$ where first entry is component along x axis and second entry is component along y axis find $\vec{a} - \vec{b} - \vec{c}$.

UNIT -15

Assessment -IV

1. Let $\vec{a}, \vec{b}, \vec{c}$ be the position, vectors of three points. If three number α, β, γ. (not all zero) can be found such that

$$\alpha \vec{a} + \beta \vec{b} + \gamma \vec{c} = 0$$

and $\alpha + \beta + \gamma = 0$

show that the end points of $\vec{a}, \vec{b}, \vec{c}$ lie on a line.

2. If the mid points of the consecutive sides of a quadrilateral are connected by straight lines, prove that the resulting quadrilateral is a parallelogram.

3. Given P (x_1, y_1) and Q (x_2, y_2) express vector $\vec{a} = \overrightarrow{PQ}$ in terms of unit vectors $\vec{i}$ and $\vec{j}$. Determine the magnitude of $\vec{a}$.

4. Prove that the right bisectors of the interior angles of a triangle are concurrent.

5. Prove that for any vector $\vec{a}$

$$\vec{a} + (-\vec{a}) = (-\vec{a}) + \vec{a} = 0$$

UNIT -15

Assessment -V

1. Prove that $|\vec{a} - \vec{b}| = |\vec{a}| - |\vec{b}|$.

2. An aeroplane has to reach a point 1600 km due north. The aeroplane has a speed of 300 km/Hr. If the wind velocity is 100 km/Hr due east in which direction the aeroplane has to take off. What will be the time of flight.

3. Show that the sum of three vectors determined by the medians of a triangle directed from the verties is zero.

4. Let ABCD be a parallelogram. Let P and Q be the mid points of BC and CD. Express $\vec{AP}$ and $\vec{AQ}$ in terms of $\vec{AB}$ and $\vec{AD}$. Also show that $\vec{AP} + \vec{AQ} = (3/2)\vec{AC}$.

5. Show that three points A, B, C whose position vectors with respect to an arbitrary point O are a, b, -3a -2b are collinear.

UNIT - 16

Assessment -I

1. Fill in the blanks :-

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} = 1\begin{vmatrix} . & . \\ . & . \end{vmatrix} - 5\begin{vmatrix} . & . \\ . & . \end{vmatrix} + 9\begin{vmatrix} . & . \\ . & . \end{vmatrix}$$

2. Show that

$$\begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = 4a^2b^2c^2$$

3. Using determinants, solve the following system of equations :-

$$x - 3y + 3z = 0$$
$$3x + 2y + 4z = -1$$
$$4x + 10y + z = 0$$

4. Write cofactors of all the elements of the determinant.

$$\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$$

5. Show that if from each element of a column of a determinant is subtracted the equimultiple of the correspond the constitutents of one column., the determinant remains unchanged.

UNIT -16

Assessment -II

1. Fill in the blanks :-

i) If two rows of a determinant are equal, then the value of the dterminant is ______

ii) The value of a determinat is ______ by changing all its rows into columns and columns into rows.

2. Prove that

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

3. Find an expressionfor infinitely a many non-trivial solutions and list two particular non-trivial solutions.

$$x + y + z = 0$$
$$x + 2y + z = 0$$
$$2x + 3y + 2z = 0$$

4. The price of 9 tables and 12 chairs is Rs. 279 and that of 8 tables and 16 chairs is Rs. 312. Following the method of determinant. Find the cost of a chair and a table.

5. Show that if any two rows of a deteriminant are identical, then the value of the determinant is zero.

UNIT -16

Assessment -III

1. Fill in the blanks :-

   i. If k is taken out from all the rows of a determinant of order 3, then the new determinant is multiplied by __________.

   ii) If one row of a determinant contains all zeros, then the value of the determinant is __________

2. Find all the cofactors of all the elements of the determinant.

$$\begin{vmatrix} 4x & 6x+2 & 8x+1 \\ 6x+2 & 9x+3 & 12x \\ 8x+1 & 12x & 16x+2 \end{vmatrix}$$

3. Prove that

$$\begin{vmatrix} a & a^2 & b+c \\ b & b^2 & c+a \\ c & c^2 & a+b \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$$

4. The cost of 5 kg wheat, 2kg rice and 3 kg. sugar is Rs. 23.
   The cost of 4 kg. wheat, [illegible] kg rice and 2kg sugar is Rs. 19
   The cost of 3kg wheat, 2kg rice and [illegible] kg sugar is Rs. 18 .
   Find the rate of each per kg.
   (use the method of determinant)

5. Show that if two adjacent columns of a determinant are inter changed the sign of the determinat is changed.

Assessment -IV

1. Fill in theblanks :-

i) $\begin{vmatrix} \sec^2\theta & \cot\theta \\ \tan\theta & \cos\theta \end{vmatrix} = \ldots$

ii) $C_{ij} = \ldots M_{ij}$ Where Cij represents the co-factor of an element of i th row, j th column. While Mij represents the minor of the same element.

2. If $D = \begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$ and the capital letters denote the co-factors of the corresponding small letters in D. Prove that

i) $BC - F^2 = aD$

ii) $CA - G^2 = bD$

iii) $AB - H^2 = cD$

3. Prove that

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

4. Solve the following equations by means of determinants

$$x + y + z - 7 = 0$$
$$x + 2y + 3z - 16 = 0$$
$$x + 4y + 4z - 22 = 0$$

5. Write a determinant equal to

$$\begin{vmatrix} 2 & 1 & -3 \\ -5 & 2 & 1 \\ 1 & 3 & 4 \end{vmatrix}, \text{ but}$$

having zeros everywhere in the first column except the lower

UNIT -16

Assessment -V

1. Fill in the blanks :-

i) Find the co-factors of all the elements in 3rd column

$$\begin{vmatrix} 18 & 40 & 50 \\ 16 & 34 & 52 \\ 12 & 28 & 40 \end{vmatrix}$$

2. If a,b, c be + ve and not all zero, show that the value of the determinant.

$$\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$$ is negative

3. Prove that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$$

4. Determine a,b, and c of the function f(x) where f(x) = ax^2+bx+c if [illegible] = 2, $f(-2) = -5$ and $f(3) =$ [illegible]

5. Show that if any two rows of a determinant are identical then the value of the determinant is zero.

Find the 10th term and the general term.

3. Is 310 a term of the A.P. 3, 8, 13, 18------.

4. Find the 40th and the nth term of the series.

$$2x5 + 3x7 + 4x9 + \text{------------}$$

6. If S_n denotes the sum to n terms of an A.P. Prove that.

$$S_{30} = 3 (S_{20} - S_{10})$$

UNIT -17

Assessment -III

1. If a_1 is the first terms and a_m the m^{th} term of an A.P. show that sum of the n terms of the A.P is $n\left(\frac{a_1+a_m}{2}\right)$

2. Find the sum of the first n natural numbers.

3. If the pth term of an A.P is q and the qth term be p, find the first term, common difference and the general term of the A.P.

4. Find the sum of all natural numbers less than 200 which are divisible by 3.

5. If x is real and $(x-a+b)^2 + (x-b+c)^2 = 0$ show that a, b, c are in A.P.

UNIT -17

Assessment -IV

1. Find x, y such that $0, x, y, 3$ are in A.P.

2. Sum the series $\dfrac{1}{1+\sqrt{x}}, \dfrac{1}{1-x}, \dfrac{1}{1-\sqrt{x}}$ upto n terms.

3. If a^2, b^2, c^2 are in A.P. then show that $\dfrac{a}{b+c}, \dfrac{b}{c+a}, \dfrac{c}{a+b}$ are also in A.P.

4. Find the sum of $3 + 5 + 7 + 6 + 9 + 12 + 9 + 13 + 17 + \ldots\ldots\ldots$ to 30 terms.

5. The pth term of an A.P is a and the qth term is b. Show that the sum of $(p+q)$ term is

$$\frac{p+q}{2}\left[a + b + \frac{a-b}{p-q}\right]$$

UNIT -19

Assessment -V

1. The 3rd term of an A.P. is p and the fourth term q. Find the 10th term and the general term.

2. Given that $(p+1)$ th term of an A.P is twice $(q+1)$ th term prove that the $(3p+1)$th term is twice the $(p+q+1)$th term.

3. Find the sum of the series

   $1+3-5+7+9-11+13+15-17+\ldots\ldots\ldots$ to $3n$ terms.

4. Find the sum of the sequence of the first n natural numbers.

5. If the sum of n terms of an A.P. is $2n^2+n$, find the rth term.

UNIT -18

ASSESSMENT -1

1. A sum of Rs. 100 is invested at 6% compounded annually. What will be the amount at the end of 1 yr. , 2yrs, 3yrs, 4yrs, 5yrs . ? What type of sequence do you get ? Also determine the amount after 12 yrs.

2. Determine the 3rd term of the G.P. whose common ratio if 3 and the sum of first 7 terms is 2186.

3. Find a rational number, which when expressed as a decimal will have $3.0\overline{109}$ as its expansion.

4. If p, q and r are in A.P. while x, y and z are in G.P. how that

$$x^{q-r}\, y^{r-p}\, z^{p-q} = 1$$

5. Prove that the sum to n terms of the A.P. 1,3,5,.........,n is n^2

6. Evaluate $\displaystyle\sum_{j=1}^{j=10} (2 + 3^j)$

UNIT -18

Assessment -II

1. Find the 7th term of $\sqrt{3}$, $\frac{1}{\sqrt{3}}$, $\frac{1}{3\sqrt{3}}$

2. In a G.P. if $(p+q)$ th term is m and $(p-q)$ th term is n, prove that pth term is $\sqrt{mn}$

3. Find the sum of the series

$$1^2 + (1^2+2^2) + (1^2+2^2+3^2) + \ldots\ldots \text{ to } n \text{ terms}$$

4. Evaluate $\sum_{K=2}^{K=10} (4^K)$

5. Find the sum of the infinite series

$$7, -1, \frac{1}{7}, -\frac{1}{49}, \ldots\ldots$$

6. Determine the 10th term of a G.P. whose 8th term is 192 and common ratio is 2.

UNIT -18

Assessment -III

1. One side of an equilateral triangle is 24 cm. The mid points of its sides are joined to form another triangle whose mid points in turn are joined to form still another triangle. The process continues indefinitely. Find the sum of the perimeters of all the triangles.

2. Find n if $1/2^{17}$ is the nth term of the sequence 16,8,4,.....

3. If a,b, c, d are in G.P. show that a+b, b+c, c+d are also in G.P.

4. Find the sum of

$$1^2 + 3^2 + 5^2 + 7^2 + \ldots \text{ to } n \text{ terms}$$

5. If $y = x + x^2 + x^3 + \text{---------}$ to infinity and $|x|<1$, show that

$$x = \frac{y}{y+1}$$

6. Evaluate $\displaystyle\sum_{i=2}^{i=7} K\left(\frac{1}{3}\right)^{i-1}$

UNIT -18

ASSESSMENT - IV

1. Is $\frac{1}{3125}$ a term of the sequence

$25, 5, 1, \text{-------------------------}?$

2. The sum of first 3 consecutive terms of a G.P. is 13 and the sum of their squares is 91. Determine the G.P.

3. Find the value of p if the sum of the infinite sequence,

$p, 1, \frac{1}{p}, \text{----------}$ is $\frac{25}{4}$

4. Find the sum to n terms of the sequence 6,66,666,....... n terms

5. Evaluate $\sum_{i=4}^{i=11} (3+2^{i})$

6. If $\frac{1}{x+y}$, $\frac{1}{2y}$ and $\frac{1}{y+z}$ are the three consecutive of an A.P., show that x,y and z are the three consecutive terms of a G.P.

UNIT -18

Assessment -V

1. If $a_1, a_2, a_3 \ldots$ are in G.P. then prove that

$$\frac{1}{a_1}, \frac{1}{a_2}, \frac{1}{a_3} \ldots\ldots \text{ are also in G.P.}$$

2. The $(p+q)$ th and $(p-q)$th term of a G.P are a and b respectively. Find its pth term.

3. Find the sum to n terms of the sequence

$$\left(x+\frac{1}{x}\right)^2, \left(x^2+\frac{1}{x^2}\right)^2, \left(x^3+\frac{1}{x^3}\right)^2.$$

4. Find the sum to n terms of the sequence

$$a^2-b^2,\ a-b,\ \frac{a-b}{a+b}$$

5. If S_n denotes the sum to n terms of a G.P. show that

$$(S_{10}-S_{20})^2 = S_{10}(S_{30}-S_{20})$$

6. Find the value of n so that $\dfrac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is the geometric mean between a and b.

UNIT - 19

ASSESSMENT - I

1. If $f(x) = 2x^2$ use delta method to find $f'(1)$. Hence determine $f'(0)$, $f'(-2)$

2. Is the function

$$f(x) = \begin{cases} x^2 + 3 & , x \leq 1 \\ 2x^2 & , x > 1 \end{cases}$$

continuous at $x = 1$?

3. Find the derivative of

$$y = -x^7 + 4x^3 + 3 \text{ at } x = -1$$

4. If $f(x) = g(x) + h(x)$ show that $f'(x) = g'(x) + h'(x)$

5. The distance s travelled by a body in time t is given by

$$s = 2 + t^2$$

Calculate

(i) The average speed of the body during first 4 seconds.

(ii) Average speed of the body during fourth second.

UNIT - 19

ASSESSMENT -II

1. If $y = 2 - 3x$ use delta method to find $\frac{dy}{dx}$. Hence determine y'

2. Is the function

$$f(x) = \begin{cases} 4x^2 & , x < 0 \\ 5 - x & , x \geq 0 \end{cases}$$

continuous at the origin ?

3. Find the derivative of $f(x) = x^{15} - x^8 + 4x^3 + 1$

4. If $f(x) = g(x) - h(x)$ show that $f'(x) = g'(x) - h'(x)$

5. The distance s travelled by a body in time t is given by $s = t(1+t)$. Calculate

(i) The average speed of the body during the first two seconds.

(ii) The average speed of the body during the 2nd second.

UNIT - 19

ASSESSMENT -III

1. If $y = 4 + 3x^2$ use delta method to find $\frac{dy}{dx}$. Hence determine $y'(0)$.

2. Is the functions

$$f(x) = \begin{cases} x^2 + 1 & x \geq 1 \\ 2x & , x < 1 \end{cases}$$

continuous at $x = 1$?

3. Find the derivative of

$$y = x^{10} - 7x^7 - x^4 + 3x + 9$$

4. If $f(x) = k\,g(x)$ show that $f'(x) = k\,g'(x)$

5. The distance s travelled by a body in time t is given by $s = t^2 + 2t + 1$. Calculate the average speed of the body during

(i) first 3 seconds

(ii) third second.

Assessment -IV

1. If $f(x) = 1 - \frac{1}{2} x^2$, use delta method to find

   Hence determine $f'(-1)$ and $f'(0)$

2. Is the function

$$f(x) = \begin{cases} x^2 + 5 & , x \leq 2 \\ 3x^2 & , x > 2 \end{cases}$$

   continuous at $x = 2$?

3. Find the derivative of

$$y = x^9 - 9x^8 + 2x^3 - 7$$

4. If $f(x) = g(x) + h(x)$ show that $f'(x) = g'(x) + h'(x)$

5. The distance s travelled by a body in time t is given by $s = t(1+3t)$. Calculate the average speed of the body during

   i) first two seconds

   ii) first second.

UNIT - 15

ASSESSMENT - V

1. If $f(x) = ax^2 + bx + c$, use delta method to find $f'(x)$. Hence determine $f'(a)$, $f'(b)$ and $f'(c)$

2. Find the derivative of the function

$$f(x) = 5x^4 - 3x^3 + 8x^2 - 4x + 7$$

3. Is the function

$$f(x) = \begin{cases} 3x - 2 & , \quad x \leq 0 \\ x + 1 & , \quad x > 0 \end{cases}$$

continuous at $x = 0$

4. The distance x travelled by a particle in time t is given by

$x = 7t^2 - 4t + 1$. Find

i) average speed during the first 4 seconds

ii) average speed during the 4th second

iii) Instantaneous speed at the 4th second.

5. If $f(x) = a_1 f_1(x) + a_2 f_2(x) - a_3 f_3(x)$ show that

$f'(x) = a_1 f_1'(x) + a_2 f_2'(x) - a_3 f_3'(x)$

(Use delta method)

UNIT - 20

ASSESSMENT - I

1. Find the slope of the tangent to the curve

$$y = x^2 - 4x + 2 \text{ at } (4, 2)$$

2. Find the equation of the tangent to the curve

$$y = 16 - x^2 \text{ at } (4, 0)$$

3. Find the equation of the normal to the curve

$$y = 2x + x^3 + 2$$

which is parallel to the line $x + 14y = -4$

4. Determine the point of the curve

$y = 3x^2 - 5$ at which the tangent is perpendicular to a line whose slope is $-\frac{1}{3}$.

UNIT - 20

ASSESSMENT - II

1. Find the slope of the tangent to the curve

   $y = -x^3 + 2x$ at $(-1, -1)$

2. Find the equation of the tangent to the curve $y = 2$ [illegible] which

   is parallel to the line $4x - y = 1$ [illegible]

3. Find the point (s) on the curve $y =$ [illegible] $x^2 -$ [illegible] $x + 5$

   at which the tangent makes an angle of 45 with the positive

   direction of the x-axis.

4. Find the equation of the normal lines to the curve $y = x$ [illegible] $- 3x$

   which are parallel to the line $9x = y - 3$

UNIT - 20

ASSESSMENT -III

1. Find the slope of the tangent to the curve

   $y = 3 - x^2 + 8x^3$ at $(1, 10)$

2. Show that x-axis is a tangent to the curve

   $y = x^3$ at the point $(0,0)$

3. Find the equation of the normal line to the curve

   $y = x^2 + 4x - 16$ which is perpendicular to the line

4. Find the point(s) on the curve $y = x^2 - 4x + 2$ where the slope of the tangent is 10.

UNIT - 20

ASSESSMENT - IV

1. Determine the point(s) on the curve $y = x^2 + 1$ at which the slope9f the tangent is equal to y- coordinate.

2. Find the equation of the tangent to the curve $y = x^2 + 2x + 1$ at $(2, 9)$

3. Determine the point(s) on the curve $y = -5 + 3x^2$ at which the normal is perpendicular to a line whose slope is 3.

4. Find the equation of the normal to the curve $x^2 - 4x + 2y + 2 = 0$ at the point $(6,5)$.

UNIT - 20

ASSESSMENT - V

1. Find the equation of the normal time to the curve $y = x^3 + 2x + 6$ which is parallel to the line $14y + x + 4 = 0$

2. Prove that the equation of the normal to $x^2 = 4ay$ at the point $(2a, a)$ is $x + y = 3a$

3. Find the equation of the tangent and the normal to the curve $y = 2x^2 - 3x - 1$ at the point (1, -2)

4. At what point the tangent to the curve $y = x^2 - 2x$ is

i) parallel to the line $y = 2x + 3$

ii) perpendicular to the line $y = 2x + 3$.

UNIT - 21

ASSESSMENT - I

1. Find the derivative of

(i) $$y = \frac{\sqrt{1-x}}{\sqrt{x+2}}$$

(ii) $$x^2 + 2y^2 - 4x - 6y + 8 = 0$$

(iii) $$f(t) = \left(\frac{2t^3+3}{3t^2+1}\right)^2$$

(iv) $$y = \frac{1}{\sqrt{3}\ x^3}$$

(v) $$g(x) = (x+3)(x-1)$$

2. If $h(x) \neq 0$ and $f(x) = \frac{1}{h(x)}$ Then show that

$$f'(x) = -\frac{h'(x)}{[h(x)]^2}$$

3. Find the equation of the normal line to the curve $\frac{x^2}{9} - \frac{y^2}{16} = 1$ at the point $(-3,0)$.

UNIT -21

ASSESSMENT -II

1. Find the derivative of

(i) $y = \dfrac{x - 4}{1 - x}$

(ii) $y = \sqrt[3]{4x + 3}$

(iii) $f(t) = \dfrac{(t^3 - 2t)^4}{(t^2 + 7)^2}$

(iv) $g(z) = z\,(z^2 + 2)\,(z - 3)$

2. If $f(x) = g(x)\,\phi(x)$ then show that

$$f'(x) = g(x)\,\phi'(x) + g'(x)\,\phi(x)$$

3. Find the equation of the normal line to the curve $2x^3 + y^3 = 10$ at the point $(1,2)$.

UNIT -21

ASSESSMENT -III

1. Find the derivative of

(i) $y = (x-3)(x+2)$

(ii) $y = \dfrac{(x+2)(3x-1)}{2x+5}$

(iii) $f(x) = (4x^2+5)^{3/4}$

(iv) $\dfrac{x^2}{9} - \dfrac{y^2}{16} = 1$ at $(-3, 0)$

2. Determine the equation of normal line to the curve

$$x^2 + 2y^2 - 4x - 6y + 8 = 0$$

at the point whose abscissa is 2.

3. If $\phi(x) = f(x)\,g(x)$ then show that

$$\phi'(x) = f'(x)\,g(x) + f(x)\,g'(x)$$

<u>UNIT - 21</u>

<u>ASSESSMENT - IV</u>

1. Find the derivative of

(i) $y = (x^4 - 1)(5x^3 + 6x)$

(ii) $f(t) = \dfrac{t^2 - 1}{t^2 + 1}$

(iii) $y = \sqrt[3]{2x^4 + x^2 - x}$

(iv) $(2x - 3y)^3 - 3x^3 + y^2 = 0$

2. Find the equation of the tangent to the curve $x^4 + y^4 = 36$ at the point (1, 2).

3. If $(p|q)$ is a rational number and if $y = x^{(p|q)}$ $(x > 0)$

then show that $\dfrac{dy}{dx} = \left(\dfrac{p}{q}\right) x^{\frac{p}{q} - 1}$

UNIT -21

ASSESSMENT - V

1. Find the derivative of

(i) $y = \sqrt{x} - \frac{1}{\sqrt{2}}$

(ii) $x^3 + 8xy + y^3 = 64$

(iii) $f(t) = (t^2 + t + 5)^{\frac{1}{3}} (t^2 + 1)^{\frac{2}{3}}$

(iv) $f(x) = \dfrac{(x^3 - 2x)^4}{(x^2 + 7)^2}$

2. A balloon has a variable diameter $\frac{3}{2}(2r+3)$. Determine the rate of change of its volume w.r.t. r.

3. If $\phi = f(x)$ where $x = g(t)$ then show that $\dfrac{d\phi}{dt} = \dfrac{d\phi}{dx}\,\dfrac{dx}{dt}$.